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TERRACING IN A LAND USE PROGRAM

by

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Erosion is a natural process without which the earth would not be habitable for mankind. The weathering of rocks, the formation of soil, the transportation of soil by wind, water, and ice have contributed a necessary encouragement to all forms of life on land and even in the air and in the oceans. Nature has also supplied agencies which restrain the eroding forces. A very important natural agency for the protection of soil from erosion is thick-growing, undisturbed vegetation such as forests with unburned forest cover and thick meadow growth or pastures not overgrazed. When this protective cover is disturbed, however, by the cutting of forests, the overgrazing of ranges, the cultivation of the soil or the normal extension of the tributary gullies of a watershed, a new control of erosion must follow to prevent wastage.

The consensus of opinion among workers upon erosion control problems is, broadly speaking: That forests effect the most satisfactory protection for steep slopes; that perennial pastures are very effective on moderate slopes; that in every agricultural area there is a rather definite limit to the steepness of slope for economic use under cultivation; and that these gently sloping cultivated fields require terracing, contour farming, and erosion-resistant and soil-improvement crops; and that nearly level lands may be protected with suitable cropping practices.

Of these typical modes of erosion control those to be used upon sloping cultivated fields are of greatest interest in reference to land use because doubtless over 75 per cent of all the cultivated land in the United States shows visible signs of erosion losses which deplete the soil fertility far exceeding the use of plant food by the crops grown. Measurements of soil losses from cultivated fields show that forty tons of the most fertile top soil is not an uncommon annual loss per acre. Six inches or more of top soil have been washed off of many cultivated fields in a generation of farm life.

Attempts to fertilize crops or to restore fertility on fields affected by erosion are only temporarily and partially effective, and are wasteful of the investment or efforts expended unless erosion protection practices accompany them. This waste occurs because the most essential processes of crop production, plowing and cultivation, are most conducive to rapid erosion. Crops which require ground breaking or other thorough tillage as a preparation for seeding or planting leave the soil exceptionally vulnerable to erosion for a long period each year, often at a season when water or wind erosion is most destructive. Crops which require row cultivation extend this period of exceptional erosion losses through the growing season when, in most good crop producing areas the rainfall is both intense and abundant.

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The relation of the seasonal intensity of rainfall to erosion upon land being cultivated is interesting. In a three-year summary report of Soil Erosion and Run-off Experiments at Raleigh, North Carolina, ending May 31, 1927, F. O. Bartel, a drainage engineer of the Bureau of Agricultural Engineering, states: "Erosion losses are greatest during the summer months when heavy and intense rain falls on a soil loose from cultivation. Three-fourths of the erosion occurred during the three summer months and nearly one-half of the run-off as compared with a third of the rainfall." He further emphasizes the relative effects of rainfall and cultivation by stating: "During June, July, August and September there occurred 45 percent of the annual rainfall, 64 percent of the run-off and 86 percent of the annual erosion." In this connection he notes that although 18-1/2 percent of the annual run-off occurred in September, it caused only 11 percent of the annual erosion upon cultivated soil. Since cultivation had ceased in August, he concludes, "Where land is under cultivation during the summer, it seems evident that protection by terraces is the only possible method of preventing a heavy loss of soil during this season," and states further, "Any system of cover crops will be only partially effective in stopping erosion unless carried through the summer."

Good cropping practices must be followed to restore fertility to cultivated land and will greatly aid in controlling erosion if in the process humus is added to the soil, but terraces are needed to protect sloping cultivated fields from erosion at times when seed bed preparation and crop cultivation render the field most vulnerable.

Terracing, as it has been developed to suit modern field cultivation practices, should be regarded as one of the essential field practices. Erosion is active on almost all cultivated fields. Terracing will save from 30 to 40 tons of the richest top soil annually on almost every acre of cultivated row crops and half as much on drilled crop-land. A good job of terracing costs approximately the same as a good job of plowing. Once correctly done the maintenance cost adds but little to the annual plowing cost. Terracing as a field practice should be accompanied by contour plowing, planting and cultivation and the use of such soil-building and soil-holding crops as can be grown most satisfactorily in a rotation.

In the nineteen years of records which the Extension Service has kept on erosion control by means of terraces and soil-saving dams, over 18,000,000 acres have been reported as protected by these structures, of which acreage over 16,000,000 was protected by the terracing of cultivated land, accompanied almost invariably by contour farming and the use of soil improving rotations usually including legumes as cover crops.

Farmers know that erosion control upon their fields is their most serious erosion problem. They appreciate their fertility losses and desire to effect a control. They have tried liming, fertilizing, cover crops, and rotations, but year after year the erosion continues and in

many cases becomes increasingly difficult to control. Terracing effects the balance of control that makes the application of lime and fertilizer and the rotation of soil building crops paying investments.

Since farmers desire to protect their cultivated lands from erosion by means of terracing, and the cost of terracing is comparable to that of plowing, for example, from \$1.25 to \$2.50 an acre is the prevailing custom charge at present, it may well be asked, why do they not terrace the land more rapidly? Strangely, the reasons are the same everywhere, but the immediate cause of delay is not the same everywhere simultaneously. First of all, inaugurating erosion control upon cultivated land is a human problem involving the changing of field practices and even touching the farmer's pride in his straight rows which, nevertheless, rob him of his wealth as effectively as a robber with an equally straight-shooting gun. Most farms lose all or the best part of the top soil before the farmer is willing to improve what he has previously considered up-to-date farming practice. Terracing then is usually resorted to as the initial step in a soil rebuilding program rather than as the soil conservation measure which it should be.

However, millions of acres of cultivated land in the United States have reached the stage of destruction from erosion at which the need for terraces is unmistakably indicated and still terracing is delayed primarily for lack of an active educational extension program. Erosion control by terracing is a highly specialized type of field of work, in which neither the farmers nor a majority of agricultural agents have been specifically trained. One southeastern state increased its rate of terracing in seven years from 25,000 acres to 221,000 acres annually by increasing the agricultural engineering specialist's service from two-thirds of one man's time to approximately twice that amount of time expended by two men with more than a corresponding amount of terracing activity among county agricultural agents. Unfortunately, at the peak of this activity both specialists became engaged in other employment and the rate of terracing in that state dropped in one year to 86,000 acres annually where it remained for three years with a further drop to 78,000 acres terraced on cultivated land in 1933. The latter drop is doubtless an influence of the economic situation, but the drop of over 60 percent to 86,000 was due to the lack of specialized educational extension aid as the record for the country showed increases in terracing for two more years and neighboring states were not affected in their terracing records to a comparable degree by the depression.

However, with the need for terracing recognized by the farmer, and the state extension service furnishing special educational engineering training in the terracing technique, two important factors still delay the actual terracing of farms. The most important of these is the need for local men well trained and experienced in the technique of terracing; the other factor is the need for surveying and terracing equipment. Obviously, the educational work of the Extension Service can not embrace the personal service of laying off and supervising the construction of terraces upon all the eroding cultivated acreage in the United States. And yet terracing, essentially a surveying and grading job performed only once in a

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lifetime on any farm, requires training and experience which most farmers do not possess and cannot acquire. The terracing which has been and is being done by the Extension Service has been accomplished entirely by personal services of county agricultural agents and local leaders carefully trained by extension agricultural engineers.

The training of local terracing workers is the most essential need as terracing is such an important land improvement affecting farm operations that no farmer will undertake it without the advice and assistance of a person experienced in the technique. During three years of the depression the influence of eighteen extension engineers activating the terracing program of county agricultural agents held the rate of terracing consistently above 1,800,000 acres of cultivated land annually. In no other way can a Government expenditure be used as efficiently to reach all farmers with equal assistance to effect control of erosion upon cultivated fields where without question the most vital national problem of erosion destruction exists.

During the year 1933 the rate of terracing new acreage of cultivated lands decreased from close to two million acres annually to one million acres terraced, in spite of the wide publicity and vastly increased expenditures which were effecting greatly needed control of erosion upon other lands. Normally, this publicity and activity in public demonstrations should have caused a notable increase in erosion control practices upon cultivated land. Since, in the face of it, voluntary activity of farmers in protecting their own lands dropped to 53 percent of the peak rate in 1931, the remedy should be of major interest in a land use program, affecting, as it does, the most valuable of all our national land resources.

The reason for the drop in rate of terracing may be traced to removal of some of the extension engineers to other fields of service and to the temporary lapse of activity of the terracing program in many states due to the exigencies of administering emergency agricultural programs. To retrieve this loss by replacing the extension engineers and reactivating the extension terracing program is not enough. The extension engineering staff has never been adequate to meet the demand for training local leaders and supervising their operations. The needed expansion will also require a national supervision by the engineering staff of the U.S.D.A., which has successfully developed and perfected the technique of terracing for the last thirty years and has written all of the bulletins, circulars, and other publications on the engineering phases of erosion control which have been published by the U.S.D.A. and have served as a basis for practically all of the state publications on terracing and soil saving dams, and the present engineering field specifications of the Emergency Conservation Work, Soil Erosion Service, and Federal Emergency Relief work.

But even an increase in the staff furnishing technical aid through the Extension Service will not fully meet the needs of many farmers who should terrace their lands. There is the further need for adequate terracing equipment which has never been sufficiently met. The States of Texas, Oklahoma, Kansas and Alabama have granted farmers the use of road

equipment at cost for terracing their farm lands. In some counties in Texas the cost charges were reported ranging from 75 cents to \$1.25 per acre. Millions of acres in Texas and Oklahoma have been terraced under such favorable conditions, but too frequently the road equipment is unsuitable for terracing or is not available. The newer and more efficient road maintenance machinery is as unsuitable for terracing as are the common farm implements.

Recently the County Commissioners of Tallapoosa County, Alabama recognized that furnishing terracing machinery and equipment was of at least equal importance to the county as road maintenance, and since the farmers were willing to pay the costs, the Commissioners bought a tractor and terrace grader to do terracing work exclusively. The plan was so successful that subsequently four more outfits were purchased, and over 6,000 acres were terraced under adequate supervision within a year at an average cost of \$1.85 per acre. Several other counties in Alabama and Georgia have since followed this plan. In Georgia, however, and in most other states, the county commissioners cannot use publicly owned equipment for this purpose, even though the farmers pay all the costs. Consequently, some private organizations must undertake the purchase and operation of the equipment.

Terracing equipment might be bought by groups of farmers through purchasing cooperative associations, or production credit loans might supply the source of cash for group purchases. The contribution of each farmer would be in proportion to his acreage, and the total cost could be spread over an acreage which the equipment could be reasonably expected to terrace in three years' time. In addition to the equipment cost each farmer would pay the operation costs upon his own farm as the work is done. Each farmer would terrace only one-third of his cultivated acreage each year for the period of three years. Maintenance charges would be prorated annually among the members of the terracing organization. Surveying and grading would be done as has been customary for more than twenty years under the supervision of the Extension Service in the usual correlated land improvement and cropping programs.

This proposal for reactivating the erosion control program of the Extension Service through provision for an adequate increase in specialists and for supervision by a technically trained and experienced engineering staff is timely in relation to the present major Extension Service activities removing acreage from surplus crop production, and rehabilitating rural relief cases. The Extension Service is finding a necessary use for soil erosion control projects in connection with these activities. Terracing also bears a distinct relation to completion of watershed control undertaken by Civilian Conservation Corps camps, and to drought relief and unemployment relief activities of the Federal Emergency Relief Administration. The extension activation is especially necessary to complete the present wide-spread Government program based principally upon cooperative demonstrations accomplished through services or grants, which can scarcely be extended to all applicants with the same facility that individuals may undertake their own erosion control work under the guidance of extension workers, already located in nearly every county of the United States.

